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SPECIFICATION FOR POTENTIAL RELAYS FOR CAPACITOR-START CAPACITOR-RUN HERMETIC COMPRESSORS

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SPECIFICATION FOR POTENTIAL RELAYS FOR CAPACITOR-START CAPACITOR-RUN HERMETIC COMPRESSORS

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Indian Standard

SPECIFICATION FOR POTENTIAL RELAYS FOR CAPACITOR-START CAPACITOR-RUN HERMETIC COMPRESSORS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 30 October 1981, after the draft finalized by the Relays Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 Potential relays covered by this standard are used in air conditioners, water coolers and other such applications where capacitor-start capacitor-run motors are employed in hermetic compressors.

0.3 Potential relays are intended to allow current through the starting capacitor and then isolate the capacitor from supply once the required speed of the motor is achieved.

0.4 This standard has been prepared to bring uniformity in the requirements of such relays mentioned in **0.2**.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS:2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers potential type auxiliary relays with normally closed contacts for use in capacitor-start capacitor-run hermetic compressors operating on single-phase, 240 V, 50Hz ac supply.

NOTE — The term 'potential relays', commonly used in airconditioning practice, is the synonym of 'voltage relays' used in electrotechnical field.

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*Rules for rounding off numerical values (*revised*).

2. TERMINOLOGY

2.1 For the purpose of this standard, following definitions in addition to those specified in IS : 1885 (Part IX)-1966* and IS : 3231-1965† shall apply.

2.2 Starting Capacitor — It is the capacitor included in the air conditioner motor circuit to improve starting feature and subsequently cut-off the motor when it reaches an adequate speed.

2.3 Drop-out Time — It is the time taken by the relay to come to its initial position when the energizing quantity is suddenly removed.

3. RATING

3.1 Rated Continuous Voltage — The preferred rated continuous voltage of the relay shall be 415 or 330 Volts.

3.2 Pick-up Voltage — The pick-up voltage of the relay shall be as agreed between the manufacturer and the user. The value shall be stated by the relay manufacturer (*see* **7.4**).

3.3 Drop-out Voltage — The drop-out voltage shall be as agreed between the manufacturer and the user. The value shall be stated by the manufacturer (*see* **7.4**).

3.4 Rated Power Frequency — The relay shall be suitable for rated frequency of 50 Hz.

3.5 Rated Breaking Capacity — The rated breaking capacity shall be as agreed between the manufacturer and the user. The value shall be stated by the manufacturer.

3.6 Rated Frequency of Operation — This normally may not exceed 20 operations per hour. The actual value, however, shall be as agreed between the user and the manufacturer.

3.7 Endurance — The relay shall be capable of operating at the rated frequency of operation under the rated breaking capacity for the number of operations stated by the manufacturer.

3.8 Limits of Temperature Test — The maximum temperature rise of the various parts shall be as specified in IS : 3231-1965†.

4. NORMAL SERVICE CONDITIONS

4.1 Unless otherwise stated, the relay shall be suitable for use under the service conditions specified in IS : 3231-1965†.

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*Electrotechnical vocabulary : Part IX Electrical relays.

†Specification for electrical relays for power system protection.

5. DESIGN AND CONSTRUCTION

5.1 Enclosure

5.1.1 The relay shall be housed in an enclosure which shall be one of those covered by IS:2147-1962*.

5.1.2 The cover of the protective enclosure shall be secured to its base such that it may not be accidentally loosened or detached owing to effects of operation of the relay.

5.1.3 The enclosure, if metallic, shall be so constructed that it is capable of withstanding continuous exposure to moisture and humidity. In addition to this, unless marked to the contrary, it shall be earthed.

5.1.4 Means shall be provided to prevent dirt falling into the movement of the relay when the relay is covered. The supporting frame work shall not be liable to distortion as a result of a change in temperature, moisture and other normal service conditions (*see* IS: 196-1966†).

5.1.5 The relay shall be so designed and constructed that reasonable mechanical shock and vibration shall not operate or damage the relay.

5.2 Contacts — Contacts shall be properly aligned to give chatter-free and hum-free operation. The contacts or the armature shall not stick under energized or de-energized positions.

5.3 Terminals

5.3.1 Terminal connections shall be such that the conductor may be connected by means of a screw or it may be flat male quick connect type or solder type. The material of the terminal may be brass and suitably plated with tin or cadmium and fitted tightly to the base and inner components.

5.3.2 A typical schematic diagram giving the use of relay in an air-conditioner is shown in Fig. 1.

5.4 Environmental Temperature Limits for Operation — Unless otherwise agreed, the relays shall be suitable for operation in an ambient temperature of −5°C to 60°C. It shall be ensured that when tested at the ambient of −5°C there is no ice formation in the relay case.

5.4.1 Unless otherwise stated, the relays shall be capable of withstanding any temperature from −25°C to +60°C under the conditions of transport and storage. The relay shall not suffer any irreversible change during transport and storage conditions.

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*Degrees of protection provided by enclosures for low-voltage switchgear and controlgear.

†Atmospheric conditions for testing (*revised*).

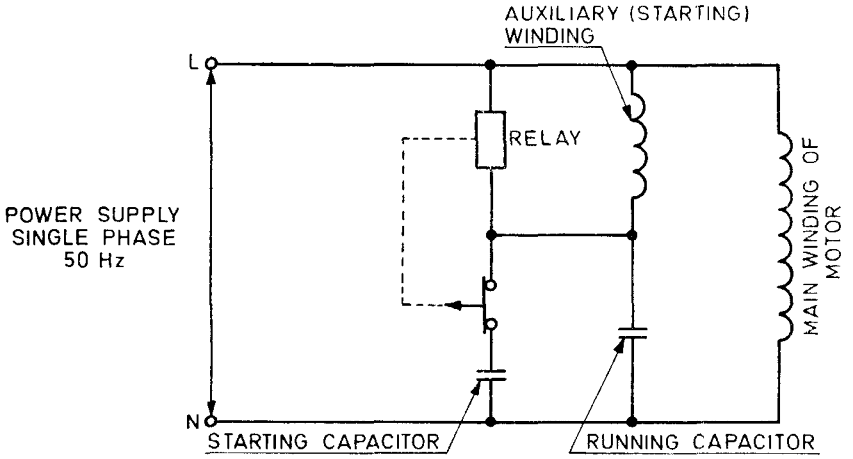

FIG. 1 SCHEMATIC DIAGRAM INDICATING THE USE OF RELAY

6. MARKING

6.1 The following information shall be marked distinctly and permanently, preferably in a position where it is visible, when the relay is installed:

a) Manufacturer's name or trade-mark, type designation and serial number;

b) Mounting position;

c) Terminal number;

d) Rated continuous voltage; and

e) Rated power frequency.

6.2 The relay may also be marked with the ISI Certification Mark.

NOTE—The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

7. TESTS

7.0 Standard Conditions

7.1 Unless otherwise agreed between the manufacturer and the user, the following shall constitute the standard atmospheric conditions of type tests:

a) Temperature: 40°C ± 1°C;
b) Relative humidity: 75 ± 5 percent; and
c) Atmospheric pressure: 860 to 1 060 m bar.

7.2 The type tests, acceptance tests and routine tests, as may be applicable, shall be performed after the relay is fixed in the desired mounting position.

7.2.1 *Type Tests* — The following shall comprise the type tests:

a) Temperature rise test (**7.3**),
b) Pick-up and drop-out voltage tests (**7.4**),
c) Environmental test (**7.5**),
d) Insulation test (**7.6**),
e) Electrical endurance test (**7.7**), and
f) Mechanical endurance test (**7.8**).

7.2.2 *Routine Tests* — The following shall constitute the routine tests:

a) Pick-up and drop-out voltage tests (**7.4**), and
b) Insulation test (**7.6**).

7.2.3 *Acceptance Tests* — The following shall constitute the acceptance tests:

a) Temperature rise test (**7.3**),
b) Pick-up and drop-out voltage tests (**7.4**), and
c) Insulation test (**7.6**).

NOTE — The sampling plan for acceptance tests shall be as agreed upon between the manufacturer and the user.

7.3 Temperature Rise Test — This test is to be carried out as specified in IS : 3231-1965*. Immediately after the completion of the test, the relay shall meet the requirements given in **7.4**.

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*Specification for electrical relays for power system protection.

7.4 Pick-up and Drop-out Voltage Tests — The values of pick-up and drop-out voltage of the relay shall be specified at 27°C (cold conditions) and at steady state temperature (hot) conditions (*see* **7.3**). The relay shall pick-up at the specified voltage and drop-out at 50 percent of the specified pick-up voltage under both temperature conditions (cold and hot). The values so obtained under two conditions shall not differ by more than 15 percent.

7.5 Environmental Test

7.5.1 The general conditions of environmental tests are specified in IS:9000 (Part I)-1977* and shall be applicable when conducting the test given in **7.5.2** to **7.5.4**. The relay shall be tested to meet the requirements given **7.4** and in addition there shall be no loosening or deformation of parts.

7.5.2 *Dry Heat Test* — The test shall be conducted in accordance with provisions of IS:9000 (Part III/Sec 1 to 5)-1977†. The relay in its unenergized and unloaded conditions shall be placed in the test chamber maintained at 100±2°C. The duration of dry heat tests shall be 48 hours.

7.5.3 *Cold Test* — The test shall be conducted in accordance with provisions of IS:9000 (Part II/Sec 1 to 4)-1977‡. The relay in its unenergized and unloaded condition shall be placed in the test chamber maintained at −25°C for a period of 4 hours.

7.5.4 *Damp Heat Test* — The relay in its unenergized condition shall be placed in the humidity chamber capable of maintaining a cyclic change of temperature and humidity of 38°C and 95 percent relative humidity (minimum) for 24 hours followed by 64°C and 5 percent relative humidity for 24 hours. The relay shall be subjected to 5 such cycles of damp heat conditions.

Immediately after the damp heat test, the relay shall be tested for insulation requirements of **7.6** by applying 75 percent of the specified test voltage between all terminals (connected together) and the body (enclosure).

NOTE 1 — For environmental tests given in **7.5.2** to **7.5.4** the relay shall be placed in the test chamber already maintained at the specified conditions of test if agreed to by the manufacturer. Otherwise, a gradual increase or decrease in temperature of 5°C in 5 minutes shall be brought about till the test temperature condition is achieved.

NOTE 2 — After each environmental test given in **7.5.2** to **7.5.4**, the relay shall be given sufficient recovery time such that it acquires the standard conditions given in **7.1**.

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*Basic environmental testing procedures for electronic and electric items:
Part I General.

†Part III Dry heat test.

‡Part II Cold test.

7.5.5 *Bump Test* — Under consideration.

7.6 Insulation Test — The relay shall withstand the insulation test satisfactorily without failure of insulation.

7.6.1 A high voltage test shall be applied between the terminals (all terminals other than earth terminal connected together) and the metallic enclosure.

7.6.2 The test voltage shall be of power frequency and shall be as near as possible to a sine-wave form.

7.6.3 The test shall be commenced at a voltage not more than half of the full test voltage. The voltage shall then be increased to the full value steadily or in the steps of not more than 5 percent of the full value, the time allowed for the increase of the voltage from half to full value being not less than 10 seconds.

7.6.4 The value of the test voltage for type test shall be 1 000 + 2 times the rated continuous voltage of the relay and maintained for a period of one minute.

7.6.5 During the routine testing of the relay, the one minute test may be replaced by a test of one second, but the test voltage shall be 2·5 kV.

7.7 Electrical Endurance Test

7.7.0 The electrical endurance test is meant to verify that the relay contacts are capable of breaking the rated current at the specified voltage.

7.7.1 The relay shall be energized by applying 110 percent of the maximum pick-up voltage and operated on a periodic load cycle of ‘ON’ period of 1/10 second and ‘OFF’ period of 20 seconds. The relay contacts shall break the maximum rated current of contacts at a power factor of 0·8. The relay shall withstand 100 000 cycles without its contacts excessively pitted and mechanical moving parts getting loose.

7.8 Mechanical Endurance Test

7.8.0 This test is meant to verify that the relay is capable of performing satisfactorily without its moving parts getting loose.

7.8.1 The test is performed at room temperature. The supply voltage of the relay is adjusted to its continuous rated value. The relay is subjected to 500 000 switching ‘ON’ and switching ‘OFF’ cycles and its current contacts are not connected to any load.

7.8.2 During mechanical endurance test, it shall not be permissible to follow appropriate maintenance as may be recommended by the manufacturers.

INDIAN STANDARDS ON RELAYS

IS:

- 1885 Electrotechnical vocabulary:
  - (Part IX)-1966 Electrical relays
  - (Part X)-1968 Electrical power system protection
- 3231-1965 Electrical relays for power system protection
- 3637-1966 Gas operated relays
- 3638-1966 Application guide for gas-operated relays
- 3842 Application guide for electrical relays for ac systems:
  - (Part I)-1967 Overcurrent relays for feeders and transformers
  - (Part II)-1966 Overcurrent relays for generators and motors
  - (Part III)-1966 Phase unbalance relays including negative phase sequence relays
  - (Part IV)-1966 Thermal relays
  - (Part V)-1968 Distance protection relays
  - (Part VI)-1972 Power relays
  - (Part VII)-1972 Frequency relays
  - (Part VIII)-1976 Voltage relays
  - (Part IX)-1977 Relays for busbar protection
  - (Part X)-1976 Relays for transverse differential protection
  - (Part XII)-1976 Differential relays for transformers
- 4483 (Part I)-1968 Preferred panel cutout dimensions for electrical relays: Part I Flush mounting IDMTL relays
- 5834 Electrical timer relays for industrial purposes:
  - (Part I)-1973 Pneumatic
  - (Part II)-1973 Motorized
- 8686-1977 Static protective relays
- 8714-1978 Electrical protective relays for use in seismic areas
- 9194-1979 Guide for maintenance and field testing of electrical relays